# Appendix D

# Engineering Design File for the ARA-16 Radionuclide Tank Piping Cleaning Method

Document ID: EDF-1407
Revision ID: Rev. 0

# Engineering Design File

PROJECT FILE NO. 020991

# ARA-16 Pipe Cleaning Methods

Prepared for:
U.S. Department of Energy
Idaho Operations Office
Idaho Falls, Idaho

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Form 412.14
10/05/99
Rev. 02

**ENGINEERING DESIGN FILE**



1. Project File No. 020991 2. Project/Task Waste Area Group 5 Remedial Design/Remedial Action-Phase 1

3. Subtask _____

4. Title: ARA-16 Pipe Cleaning Methods

5. Summary: This EDF is to document the pipe cleaning methods considered for the remedial action of Operable Unit 5-12, Power Burst Facility and Auxiliary Reactor Area. As part of this action, the drain system used to carry waste to an underground storage tank (ARA-729) will be remediated in accordance with the signed Record of Decision. A high-pressure water rinse is the recommended option for remediating the ARA-16 drain lines at ARA I.

## Background Information

**Site Description.** Auxiliary Reactor Area (ARA)-16 is the site of a 1000-gal stainless-steel underground storage tank (ARA-729) located behind ARA-I. The tank was installed in 1959 and taken out of service in 1988 when ARA-I was shut down. The tank was pumped out with about 6-in to 9-in of material remaining. All pipes and connections to the tank were removed and capped. The tank is located in a secondary containment consisting of an 8-in.-thick open concrete containment vault. Within the vault, the tank is nested in gravel. About 3.5 feet of mixed soil and gravel cover the tank and vault. The tank is surrounded by a barbed wire chain-link fence that is 7 ft tall and gated. Waste was transferred to the tank via a piping system of 4-in and 2-in stainless steel pipes.

**Tank Piping.** The ARA-16 drain system has a total of 375 feet of 4-in stainless steel pipe and 127 feet of 2-in stainless steel pipe currently in the ground. The pipe inside Building 627 was removed by a previous D&D action. The pipe inside Building 626 was left in place. All drains in Building 626 have a lead drain plug installed (see attached drawing C-5). The tank-end of the pipe was permanently capped in 1988 however, the method of capping is unknown (ie. flange, valve, cap, etc...). In addition, it is unknown if the building-end of the pipes were ever open since this time; therefore, the current contents of the pipe are unknown. As a worst case scenario, the entire pipe could be filled adding 266 gallons of liquid to the total waste volume.

**Tank Contents.** ARA-16 was the recipient of liquid radioactive wastes from two processes, the hot cells operations in building ARA-626 and materials research and testing in ARA-627. Wash water was routed to the tank from the hot cells from 1959 until the facility was shut down in 1988. Materials research and testing were supported at ARA-I from 1970 to 1984, resulting in the disposal of radioactive metal etching fluids to ARA-16. As stated in the Power Burst Facility and Auxiliary Reactor Area Record of Decision, there is 4.5 gallons of sludge plus 312 gallons of liquid in the tank for a total volume of 316.5 gallons. The analytical results indicate an F-listed, TSCA regulated waste containing a variety of radionuclides, solvents, metals and organic compounds.

## Pipe Cleaning Methods Considered

In each pipe cleaning method considered, the tank will be used as the collection for waste and wash water during the pipe cleaning action. Before any cleaning takes place, the pipe must be reconnected to the tank. This can be accomplished by installing a self-tapping valve into the lowest point of the capped pipe. Insert the end of a hose into the 4-in inlet and attach the other end to the tapped valve. As a worst case scenario, the maximum possible volume of 266 gallons could empty into the tank without filling it. Once the pipe is empty, install a stainless steel section to reconnect the drain system to the tank. A video inspection can be used to verify the cleaning effectiveness after the action is complete.

**Solvent Flush.** At each drain, pour sufficient quantities of solvent (Sodium Hydroxide, DRANO...etc) to dissolve all debris in the pipe. Add water to rinse the solvent and carry the suspended debris particles to the tank.

**Pig Dragging.** Pull a cable to each drain and with a winch truck then attach the pig at the drain opening. Pull the pig from the drain into the tank. The pig will scrape any debris on the sides of the pipe and push them into the tank.

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**High Pressure Water Nozzle.** At each drain, insert a pressure hose with a spinning "jetter" attachment. Feed the hose into the drain until a branch with another pipe is reached. Retract pressure hose. Cut the pipe that has been cleaned and cap near the remaining pipe. Repeat for each drain until all the lines have been cleaned and cut. The force of high-pressure water will remove all debris in the pipe and carry it in suspension to the tank.

**Conclusions.** The solvent flush method does not guarantee complete coverage inside the pipe. It also does not address non-organic debris that is stuck to the pipe. This debris requires a mechanical force to be effectively removed. There is a potential problem with a reaction between the waste in the tank and the solvent being added. The addition of solvent would also change the waste characterization possibly requiring further sampling and potential problems with the ATG waste acceptance criteria.

The pig dragging method requires a cable to be inserted into the pipe and then retrieved by using a winch. The person operating the winch would be exposed to potentially high rad particles. The cable being pulled around bends in the pipe would potentially break the pipe creating an underground release of contaminants. The PCB's are generally found in oils. The pig scraping the sides of the pipe may not be effective in cleaning an oily contaminant from the pipe walls. Thus, a rinse process would follow the pig dragging.

High-pressure water has the mechanical cleaning force to remove debris stuck on the pipe. Surfactants can be added to the water to solubilize the PCB oil film. The high-pressure rinse is the recommended option for remediating the hot drain lines at ARA I. This method will provide the highest cleaning efficiency and lowest RAD exposure. It requires equipment and expertise that is typical for any local sewer-cleaning contractor.

6. Distribution (complete package):

Distribution (summary package only):

7. Review (R) and Approval (A) Signatures: (Minimum reviews and approvals are listed. Additional reviews/approvals may be added as necessary.)

| | R/A | Printed Name | Signature | Date |
|---|---|---|---|---|
| Author | | Jacob Harris | | 24 May 2000 |
| WAG 5 Project Manager | A | Frank Webber | | 5/24/00 |
| Technical Coordinator | R | Kurt Fritz | | 5/30/00 |
| Project Engineer | R | Steve Davies | | 5/30/00 |

## Appendix D - Abbreviated ABAQUS Input File

**Project:** Waste Area Group 5 RD/RA - Phase 1 **Calc. No.:** EDF-1406 Attachment **Rev.:** 0
**Calc. Title:** Stress Analysis for Lifting ARA-16 1000 Gal. Underground Tank
**Originator:** B. D. Hawkes **Date:** 04/17/00 **Checked By:** E. D. Uldrich **Date:** 04/17/00

```
*HEADING
tank_086_full.inp ARA tank - pick up tank by lugs on blind flanges
*NODE, SYSTEM=R
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```
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*ELSET, ELSET=ALL_EL, GENERATE
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BS000002,     2, 3,       0.00000E+00
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**  TANK DW + FLUID
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*NSET,NSET=BS000002
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*EL FILE,FREQUENCY=        1,POSITION=NODES,DIRECTIONS=YES
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*END STEP
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